SSTD-8070-0001-CONFIG Revision E-1
FEBRUARY 2016

National Aeronautics and
Space Administration

John C. Stennis Space Center
Stennis Space Center, MS 39529-6000

COMPLIANCE IS MANDITORY

John C. Stennis Space Center
FACILITIES ENGINEERING DOCUMENTATION STANDARD

Original Signed By:

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NASA SSC Center Operations Directorate — Date
Chief, Design & Construction Project Management Division

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Issued CEF — 9/4/13
Central Engineering Files — Date

Document History Log

Change/ Revision	Date	Originator/ Phone	Description
Basic	09/11/01	Jim Wolfenbarger ext. 8-2304	Initial release - supersedes SSC STD 66-500 Rev. M, with the following changes: New document number and format per SPG 1400.1; Change signature title per NASA SSC reorganization; Change Facilities Engineering Division (FED) to Engineering Services Division (ESD); Change CADD/Documentation Supervisor to Drafting/Standards Manager; Changes as needed for new document numbers; Figure 2 revise block 3 for "EO Sheet" SORD; 1.0 new title and complete rewrite; 2.0 add ref to SWIs 8810-0003 and 8810-0012; 3.0 Responsibilities add new, Acronyms and Abbreviations move to Appendix A; 4.0 combine step c with steps b and e, change d to c; 7.2.1 add ref to SSTD 8070-0002-CONFIG; 7.3.2.1 add ref to "structural" type drawings; 7.3.2.4 add ref to "type J" drawings; 7.3.3 delete ref to types K, F, T, N and W; 7.4 delete "issuance"; 8.3.1 delete text redundant to Section 1.2; 8.3.2, 8.3.6.3, and 10.1.1 delete microfilming; 8.3.3.1 revise text and move to 8.3.5.1 and 8.3.5.2; 8.3.3.4 revise for clarity; 8.3.4.1 add new Figure 3 for EMI approval by FRB; 8.3.4.3 move EO-related text to 8.3.5.1, delete "crossing out" of change data; 8.3.5.1 step a complete revision; 8.3.5.1-f change "drawing" to "EMI"; 8.3.5.2-a change EO incorporation requirement; 8.3.9.1 add COC requirement for EMI procurements; 8.3.9.2 add dig permit (form SSC-618) and CCC 5-part card (form SSC-633); 10.1.3 change database access authority.
Admin Change Basic-1	10/03/01		In all places, change "5-part card (form SSC-558C)" to "CCC 5-part card (form SSC-633)".

A	01/12/07	James W. Hughes ext. 8-2304	Revalidated. Updated references and amended text to reflect proper references. Corrected typographical errors throughout document. Changed titles for signatures per NASA SSC organization changes.
B	05/25/07	James W. Hughes ext. 8-2304	Deleted reference to SWI-8810-0003-FACENG per document cancellation; this document was not superseded. Deleted references to SSLP-1440-0001 per document cancellation; replaced with superseding document SPR 1440.1. Appendix A: deleted SSLP, deleted SOP, added FOSC, and added CFO. Replaced references to NASA Engineering Services Division, Design Branch with Project Management Division throughout document per NASA organization restructure.
C	01/28/10	Jeanne Keller ext. 8-2104	Updated to conform to National CAD Standard requirements. Deleted references to SSC STD 99-006 per document cancellation; replaced with superseding document SSTD-8070-0004-CONFIG. Administrative changes. 7.0 Added All SORD drawings and revisions for acceptance are to be signed by NASA Center Operations. 7.2.1 Added New SORD drawing numbers are generated from the CEF drawing list. 7.3.2.1 Added Structural drawings. 7.3.2.7a Change Reference Sheets to Quads 7.3.2.7b Added “to quads”. 7.4 Deleted © new work cannot be put on the existing baseline drawing. These drawings shall be C, D, or F size only. Do not use “B” size drawings for EMI documents. 7.5 Deleted These drawings are type B. 8.2 Changed “other minor errors including errors of omission” with “grammatical errors.” 8.3.3 Added “in blue Ink. Changed “non-black” to “red”. 8.3.5.1a Changed “project goes to construction” to “EMI is issued for construction.” 8.3.6.3 Deleted “Approved and released through CEF” 8.3.8.1 and 8.3.9.2: change 5-part to 4-part. 9.1 Added Reports and studies are numbered by crew, fiscal year and sequence number. 10.1.1 Deleted All text/specifications that are included in

			NASA SpecsIntact shall be presented in SpecsIntact. All specifications not in SpecsIntact shall be in the approved site word processing software. Added "conform to SSTD-8070-0002-CONFIG."
C-1	06.09.11	Jeanne Keller ext. 8-2104	Updated references. Changed TOC to FM&O. changed Technical Monitor to COTR. 4.0c: added Engineering Change Request (ECR), Minor Service Order (MSO), Minor Maintenance Order (MMO), internal work request (IWR) and technical procedures. Added **"**E&TD TOC may use electronic signature for Test Complex 11xxx-Pxxx Series SORD drawings." Throughout document where appropriate. 7.2.3a: added SORD Drawing. 7.3.2.6a: added Pipe drawings will show fluid, type pipe with line number, pipe support location and number, and number and component number. 7.3.2.6e(2): added pipe line numbers. 8.3.2 Drawing Cancellation: revised to "a. To cancel a drawing and revise it to the next revision number: 1. Write in the revision space of the title block that the drawing is cancelled and what drawing number the revised drawing will have. 2. Above the description, write the word "Canceled" 3. Crosshatch the drawing. b. To cancel a drawing that will not be revised to the next revision number: 1. Above the title block description, write the word "Canceled". 2. Crosshatch the drawing.
D	6.30.11	J. Keller/8-3043	Administrative change to correct revision number. See Rev. C-1 for signature approval.
E	08.23.13	J. Keller/8-3043	Added to Section 1.2: "b. All SSC base contractor developed designs and changes to design documentation in the construction phase shall be approved and routed electronically. Electronic approvals are acceptable forms of approval. c. Off-site firms should deliver electronic files which then should be routed for on-site review and approval. Added to section 7.0 e.: "CEF shall officially issue SORD drawings." Removed "blue ink" from Section 8.3.2b. Removed "E&TD TOC may use electronic signature for Test Complex 11xxx-Pxxx Series SORD drawings" from Sections 7.0c and 8.3.2b.

E-1	02.11.16	C. Wolfram 8-1164	Administrative changes. Replaced "FOSC" with "SACOM" throughout document. Replaced "SWR" with "Task Order" throughout document. Replaced "TOC" with "Test Complex" when reference involved physical Test Complex area; and "SACOM," regarding contractual and/or process references.

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FIGURES

TABLES

1.0 INTRODUCTION

1.1 PURPOSE

This John C. Stennis Space Center (SSC) Standard (SSTD) establishes the responsibilities, requirements and practices for facility engineering documentation related to the as-built configuration control of Site-wide Operation and Repair Document (SORD) systems at the SSC.

1.2 APPLICABILITY

a. This SSTD complements SSTD-8070-0002-CONFIG (*SSC Facilities Drafting Manual*) and applies to all SSC NASA organizations, resident agencies, contractors and sub-contractors involved with the design, implementation, operation and documentation of configuration changes to SSC SORD systems and their related baseline control documentation.

b. All SSC base contractor developed designs and changes to design documentation in the construction phase shall be approved and routed electronically. Electronic approvals are acceptable forms of approval.

c. Off-site firms should deliver electronic files which then should be routed for on-site review and approval.

1.3 AUTHORITY

This SSTD shall be controlled and maintained in accordance with SSTD-8070-0005-CONFIG and Section 3.0 herein. Final authority for the approval and interpretation of this SSTD resides with the SSC Center Operations Directorate Chief, Design & Construction Project Management Division.

2.0 REFERENCES

Referenced documents shall be the latest edition unless otherwise specified.

SPR 1150.1, *John C. Stennis Space Center Establishment of Charters Boards/Councils/Committees*
SPR 1400.1, *SSC Document Preparation, Numbering, and Management*
SPR 1440.1, *SSC Records Management Program Requirements*
SPR 8830.4, *SSC Policy Directive Facility Design Engineering Directive*
SSTD-8070-0002-CONFIG, *SSC Facilities Drafting Manual*
SSTD-8070-0004-CONFIG, *SSC Preparation of Construction Specifications*
SSTD-8070-0005-CONFIG, *SSC Preparation, Review, Approval and Release of SSC Standards*
SSTD-8070-0006-CONFIG, *SSC Component Servicing Documentation*

SSTD-8070-0009-CONFIG, *SSC Preparation of Form SSC-625, Certificate of Completion (COC)*
SSTD-8070-0010-CONFIG, *SSC Maintenance of the System Operation and Maintenance Responsibility Database (SOMRD)*
SSTD-8070-0111-IDCODES, *SSC Requirements for the Numbering of SSC Locations, Mechanical Components, and Pressurized Vessels and Tanks*
SOI-8040-0001-FACENG, *SSC Organization Instruction Construction Configuration Management*
SOI-8080-0015, *Configuration Control of Propulsion Test Systems*
SSC Building Plans Manual, *Space Utilization/Facility Floor Plans*
SSC DWG 54000-E001, 2, and 3, *SSC Electric/Electronic Legends*
SSC DWG 54000-P001, *SSC Piping Schematic Legends*
SSC DWG 20000-E010, *SSC Electrical Panel Instruction*
EF-P-03, *Management System Procedure, Central Engineering Files (CEF) Procedure*

Forms

NASA form 1046*, Transfer and/or Notification of Acceptance of Accountability of Real Property*
NASA form 1509, *Facility Project Document (FPD)*
SSC-61, *Facility Change Request (FCR)*
SSC-151, *Engineering Modification Instruction (EMI)*
SSC-151D, *Engineering Order (EO)*
SSC-618, *Dig Permit*
SSC-625, *Certificate Of Completion*
SSC-633, *Certification/Configuration Control Card*
SSC-650, *Engineering Change Request (ECR)*
SSC-702, *Project Data Sheet (PDS)*
SSC-781, *Request For Information (RFI)*

3.0 RESPONSIBILITIES

a. NASA SSC Center Operations Directorate Design & Construction Project Management Division is responsible for oversight and acceptance of projects and related documentation affecting SSC facilities configuration baseline in accordance with Section 4.0 herein.

b. SSC Facilities Review Board (FRB) and Configuration Control Boards (CCBs) are responsible for identifying and monitoring changes to SSC facilities baseline configuration in accordance with Section 8.1 herein.

c. Synergy-Achieving Consolidated Operations and Maintenance (SACOM) Engineering Services Department (ESD) Design Engineering and Drafting are responsible for maintaining drawings identified in this SSTD in accordance with SSTD-8070-0002-CONFIG.

d. Central Engineering Files (CEF) is responsible for release, repository and archiving of the documentation identified in this SSTD in accordance with SPR 1440.1, EF-P-03 and this SSTD.

e. NASA SSC and contractor organizations are responsible for review and approval of changes to or cancellation of this SSTD in accordance with SSTD-8070-0005-CONFIG.

f. SACOM ESD shall support the NASA SSC Center Operations Directorate Project Management Division with development, review, approval and release of changes to or cancellation of this SSTD in accordance with SSTD-8070-0005-CONFIG.

g. Users of this SSTD shall comply with its requirements, ensure use of the correct version of this SSTD and the documents it references, and inform the appropriate organization of needed changes in accordance with SSTD-8070-0005-CONFIG.

4.0 FACILITY DESIGN AND INSTALLATION DOCUMENTATION

a. All design and construction projects that affect SSC facilities configuration baseline shall have a NASA Project Manager and NASA Contracting Officer's Representative (COR) assigned by the NASA SSC Center Operations Directorate Project Management Division.

b. Unless specified otherwise on the work plan, the Project Manager shall ensure that applicable documentation is completed in accordance with this SSTD and the referenced documents herein.

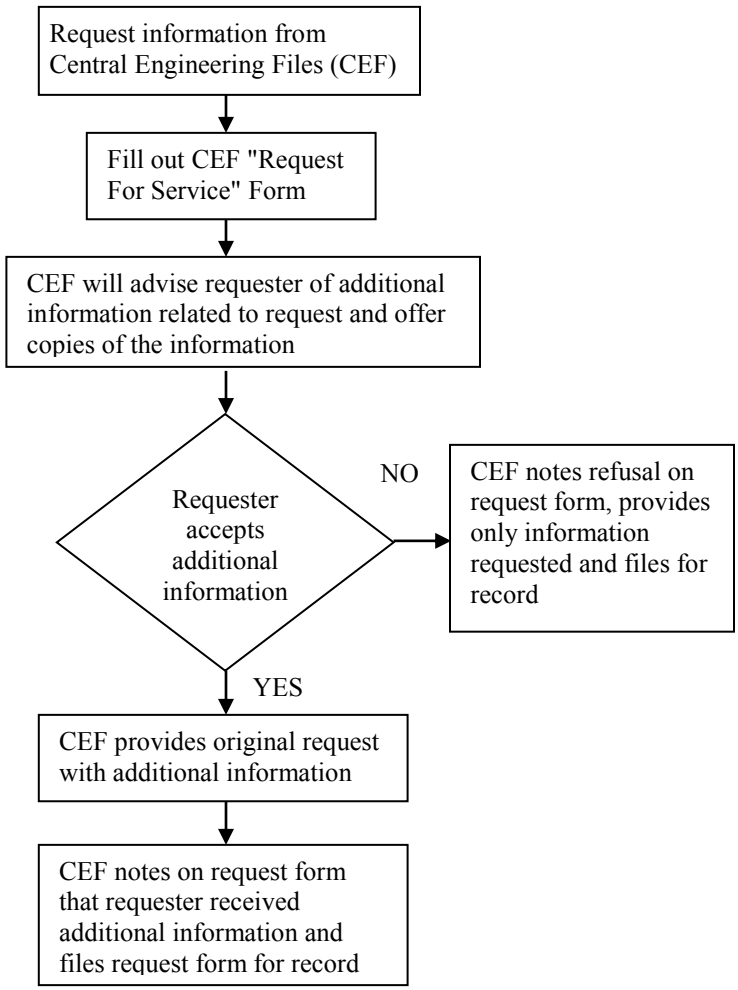
Note: For most projects, one person can serve as both Project Manager and COR; however, a given project may have separate individuals assigned to these roles, in which case the COR supports the Project Manager.

c. Facility drawings define the configuration and provide control documentation for roads, canals, utilities, buildings, and other primary facilities at SSC. Affected systems are identified by the SORD Family Tree system defined in Section 7.2. All configuration control documentation, including design drawings for original SSC facilities (which are included in the SORD system), original shop drawings prepared by vendors, and facilities configuration change documentation, such as Engineering Modification Instructions (EMI), Engineering Orders (EO), Engineering Change Request (ECR), Field Change Requests (FCR), Minor Service Order (MSO), Minor Maintenance Order (MMO), Internal Work Request (IWR), Request For Information (RFI), and technical procedures shall be filed in CEF. See Section 8.1.

d. Persons requesting information from CEF are required to fill out a CEF "Request for Service" form. (Refer to EF-P-03.) CEF is responsible to inform the requestor of any other

documents that may affect the correctness of the information being requested and to note on the work request if the customer refuses the additional information. (See flowchart, Figure 1.)

Figure 1. Process Flow Chart for Customer Request of Information from CEF.



5.0 TECHNICAL SYSTEMS DESIGN AND INSTALLATION DOCUMENTATION

This documentation consists of drawings, technical specifications, and operations and maintenance (O&M) manuals that make up the design packages for test complex technical systems. The following type technical systems are installed and operating: Facility/Special Test Equipment (STE), Test Instrumentation Systems, Facility/STE Test Item Control Systems, Test Support Systems (High Pressure Gas/Water and Cryogenics), Control and Instrumentation, Communications Systems, and Test Warning Systems. These technical system drawings are identified by SORD-1X-XXXX-XXX drawing number and have been incorporated in the SORD system as 48000-XXXX. Advanced Electrical Schematics are required documentation generated to facilitate tracing circuits.

6.0 FLOOR PLAN DOCUMENTATION

Floor plans issued by Real Property are plans of buildings or structures showing exterior walls, fences, interior partitions, windows, doors, other wall and/or floor openings, and room identification numbers. Floor plans are not part of the SORD system. (See SSC Building Plans Manual)

6.1 NUMBERING SYSTEM

Each drawing will be identified by the building or structure number of the building shown.

6.2 UPDATE REQUIREMENT

Revisions to the SSC Building Plans Manual showing the latest configuration of the facility are printed annually. Floor plan drawings will be updated as projects are completed. Drawings may be updated numerous times during the year. The date serves as a revision and will be changed every time the drawing is updated.

7.0 SORD

a. SORD is the NASA approved as-built baseline documentation system for SSC. SORD documentation is defined as the drawings and specifications that shall be updated and maintained to reflect current configuration of SSC facilities and systems.

b. Configuration management requirements are defined by NASA and shall be maintained by all contractors at SSC.

c. SORD drawings shall be formatted according to SSTD-8070-0002-CONFIG. Drawings prepared by an outside contractor require submittal to the NASA SSC Center Operations Directorate Project Management Division. The approval block for NASA Engineering and NASA Safety does not reflect technical approval nor relieve the contractors of their

liabilities; it only reflects acceptance. All SORD drawings and revisions for acceptance are to be signed by NASA SSC Center Operations Project Management Division.

d. CEF shall ensure that new and revised SORD drawings are in compliance with this SSTD.

e. CEF shall officially issue SORD drawings.

7.1 FAMILY TREE

a. The SORD system is based on a family tree that defines the drawing numbering system at SSC. Each drawing and specification is assigned a specific location by CEF on the tree for ease of traceability.

b. The complete family tree drawing, in matrix format, is on the Computer Aided Design and Drafting (CADD). This drawing has been designed to provide for expansion of the SORD system in developing the site and shall be revised to reflect any new facilities or systems.

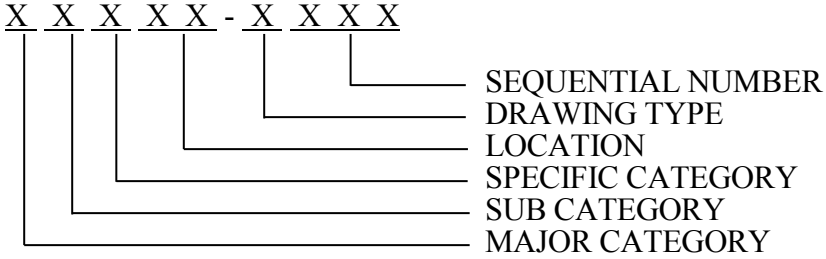
7.2 NUMBERING SYSTEM

7.2.1 SORD

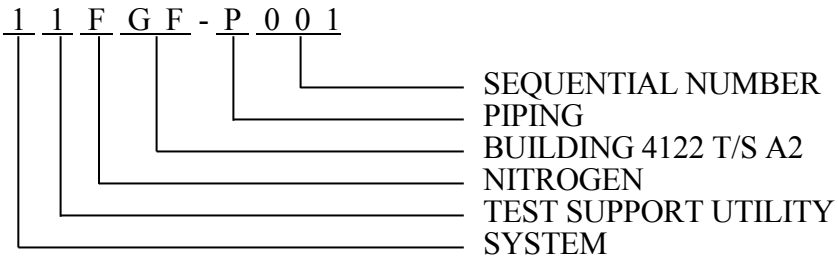
a. Each drawing is given a nine-digit alpha-numeric number derived from the SORD Family Tree matrix by CEF.

b. All baseline documents shall be identified by a SORD number.

c. Each document number shall be recorded on the specific category drawing list. New SORD drawing numbers are generated from the CEF drawing list. The drawing number is derived as follows:

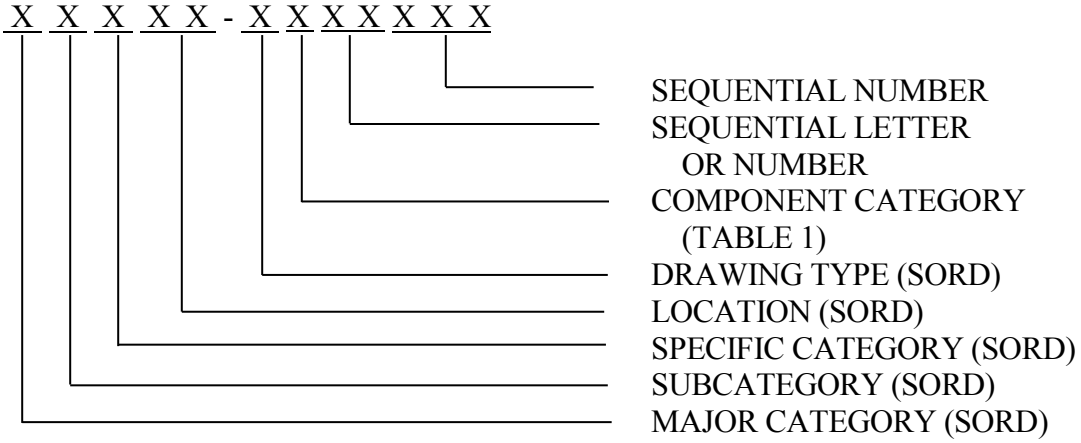


Example:



7.2.2 SCD

SCD numbers are assigned by CEF in accordance with SSTD-8070-0111-IDCODES and SSTD-8070-0006-CONFIG. The SCD number is a 12-digit alpha-numeric number, the first six of which are derived from the SORD Family Tree drawing and are invariable; e.g., 54B00-G. The seventh digit is a letter which designates the component category, as shown in the example below. The remaining five digits are reserved for sequentially assigned letters and numbers. The SCD number is derived as follows:



Example:

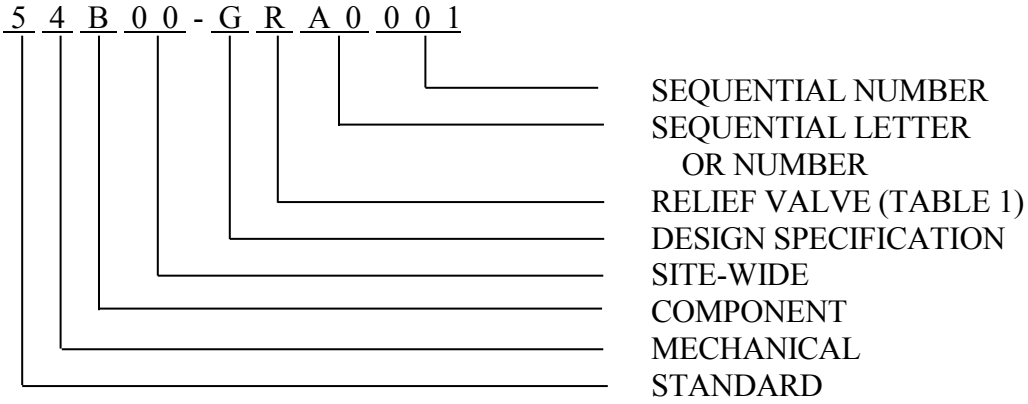


TABLE 1. SCD COMPONENT CATEGORY LIST

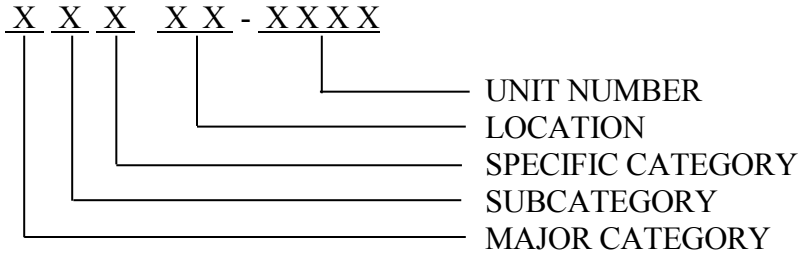
Code	Component	Code	Component
A	Control Package	N	Level Control Valve
B	Control Valve	P	Pressure Control Valve
C	Check Valve	Q	(Not Assigned)
D	Dome Loader	R	Relief Valve
E	Expansion Joint	S	Strainer
F	Flex Hose	T	(Not Assigned)
G	Gas Filter	U	(Not Assigned)
H	GH-Flow Meter	V	Hand Valve
J	GJ-Gage (Pressure Indicator)	W	Accumulator (Vessel)
K	Pump	X	Actuator
L	Liquid Filter	Y	Diaphragm
M	Motor Valve	Z	Solenoid Valve

7.2.3 Equipment Numbering

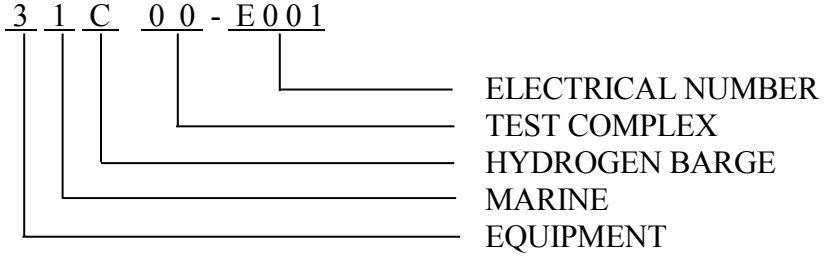
a. All equipment requiring configuration management (baseline equipment) shall be given a nine-digit alpha-numeric SORD Drawing number derived from the SORD Family Tree matrix by CEF.

b. The subcategory and the specific category shall correlate with the type of equipment within each building.

c. The unit number shall correlate with the type of equipment (e.g., mechanical, electrical). The equipment number is derived as follows:



Example:



7.3 DOCUMENTATION DEFINITIONS AND REQUIREMENTS

7.3.1 General

7.3.1.1 Building/Area - Index List (Drawing (DWG) Nos. 20000-D002 - D012)

A cross-index list providing reference from the three-digit "building number" (Section 6.1) to the SORD drawing list number shall include all trade discipline drawings required for each building.

7.3.1.2 Site Plan - Building Numbers

a. A map of the entire SSC fee area drawn to the scale of 1=10,000 or metric (SI) scale, as appropriate for the accuracy required, shall be annotated to indicate which scale system is utilized.

b. Each building and structure shall be shown with its NASA approved building number.

7.3.1.3 SCDs

SCDs are prepared to define the specifications of certain components used at SSC. Refer to SSTD-8070-0006-CONFIG and SSTD-8070-0002-CONFIG for more information.

7.3.2 Facility

7.3.2.1 Architectural - Structural

The normal building trade drawings include floor plans, elevations, sections, details, and equipment layout. Architectural and Structural drawings are designated type A. **Note:** Changes in modular systems and partition arrangements will not be kept up-to-date on floor plans (Section 6.0) unless required for clarity.

7.3.2.2 Civil

The normal trade drawings include area plans, landscaping, road plans, profiles, and contours. These drawings are designated type C.

7.3.2.3 Electrical

a. The facility electrical drawings include lighting plans, facility equipment installation, one-line power distribution schematics, wiring diagrams, and conduit schedules.

b. Electrical panel schedules shall be maintained and updated in the CEF Electrical Panel Schedule Database in accordance with 20000-E010 (Procedure for Updating the CEF Panel Schedule Database & General Panel Board Requirements at SSC).

c. For new facilities or major renovations to existing facilities, the configuration will be updated to include 110-volt systems, and maintained.

d. All EMIs, EOs, and FCRs involving electrical load modifications at/or above the 110-volt level require FRB and/or CCB coordination prior to implementation. These drawings are designated type E.

7.3.2.4 Communication

These drawings include those for the Energy Management Control System (EMCS) and are designated type J.

7.3.2.5 Mechanical

Normal trade drawings include heating, ventilating, air conditioning plans/elevations; plumbing plans/profiles; and other utility plans/elevations. These drawings are designated type M.

7.3.2.6 Piping Schematic

a. Pipe drawings will show fluid, type pipe with line number, pipe support location and number, and number and component number.

b. Piping schematics are piping diagrams drawn in single line flow schematic forms, depicting the relative location of all components used in the piping system.

c. Only one specific "system" shall be shown on a piping schematic.

d. Purge lines shall be shown on the prime system only, to the first valve restricting inter-mix of systems. These drawings are type P.

1. Location Grid Key Block

a. All test stand piping schematics shall have a location grid key block per legend sheet DWG 54000-P001.
b. Key components shall be assigned references to help locate them on the stands.

2. Component-System Locator Numbers

a. Each component and pipe line numbers shall be identified on the drawings.
b. Each component shall have a system component locator number provided by CEF.

7.3.2.7 Site Distribution Plan

a. Index Sheet/Reference Sheets

1. The first sheet of the Site Distribution Plan is the index sheet.

2. The index sheet shall show the entire system throughout the site.

3. The index sheet shall be divided into thirty-six (36) "Quads".

4. Each "Quad" shall interface with its adjacent sheets.

5. Each "Quad" shall be prepared to a scale per SSTD-8070-0002-CONFIG.

b. Underground - Site Wide Drawings (44000)

These provide details of construction and shall be cross-referenced to Quads.

c. Above Ground – Site Wide Drawings (46000)

These provide details of construction and shall be cross-referenced to Quads.

d. Fluid Utility Systems

1. Drawings and the piping schematics for each area shall be cross-referenced.

2. Piping locations shall be referenced by the piping schematics for each applicable area.

3. Locations of all service access ways through which a system passes (e.g., valve pits and manholes) shall be shown.

7.3.3 Technical Systems

7.3.3.1 Advanced Schematics - Electrical

a. An Electrical Advanced Schematic shows, by means of graphic symbols, the point-by-point electrical connections and functions of a specific circuit. This schematic facilitates tracing the circuit and its functions without regard to the actual physical size or shape of the component or parts within an assembly.

b. The advanced schematics shall be developed so they can be read functionally, top-to-bottom, or be consistent with the existing advanced schematics within the same system.

c. These advanced schematics shall be primarily mono-system with interfacing systems shown for reference only. These drawings are designated type K.

7.3.3.2 Advanced Schematics - Instrumentation

Instrumentation Advanced Schematics shall be generated according to the same rules of Section 7.3.3.1. **Exception:** More than one system may be shown on the advanced schematics if there is an interrelationship between these systems, unless depicting them separately would more clearly define each system. These drawings are designated type K.

7.3.3.3 Block Diagrams

a. A block diagram is a single-line drawing with block outlines to designate units of functional groups for system definition.

b. It shall be Sheet One in the package of system Advanced Schematics.

c. The block diagram shall be primarily mono-system (with interfacing systems shown for reference only).

d. The block diagram shall be developed from top to bottom. These drawings are designated type K or W.

7.3.3.4 Installation and Equipment Drawings

a. The installation and equipment drawings are required to document the technical systems equipment installations.

b. The physical location of equipment shall be presented on layout drawings which may encompass an area as small as a panel or relay rack, or as large as a building or complex. Where appropriate, the panel subassemblies may be combined with the internal wiring diagram.

c. Where large areas are involved, the equipment layout shall be the installation type, and the location of the equipment shall clearly be identified with regard to adjacent buildings or portions thereof. These drawings are designated type F.

7.3.3.5 Interconnection Wiring Diagrams

a. A form of connection or wiring diagram, these drawings show only external connections between unit assemblies, system components, or equipment.

b. The internal connections of these assemblies, components, or equipment shall not be included on this drawing unless absolutely required for clarity. These drawings are designated type F.

7.3.3.6 Wiring Diagrams

a. These drawings delineate the point-to-point wiring within an item of equipment, component, assembly, enclosure, or panel.

b. The general physical arrangement of terminations shall be correct, but there is no requirement for a detailed physical routing of wiring. (This diagram may be shown on the assembly layout.) These drawings are designated type W.

7.3.3.7 Wiring Termination Sheet

a. These drawings depict wiring interconnections between bays, racks, and terminal boxes. They shall show each terminal (used or spare) and the wire termination with a reference to the cable schedule or installation drawing for routing.

b. Destination and drawings to terminate the other ends of the wires and cables shall be referenced. Where wiring termination sheets exist, wire schedules are not required. These drawings are type T.

7.4 NEW DRAWING GENERATION

a. New drawings are generated when the site modification requires facility additions or there is new equipment for which there are no existing baseline or vendor drawings.

b. New baseline (SORD) drawings shall be prepared consistent with the requirements of this SSTD and SSTD-8070-0002-CONFIG.

c. Standard (multi-use) items shall be drawn in SORD format.

d. The first drawing shall show assembly and/or installation information and will contain sufficient detail to maintain design criteria. This drawing will become a new baseline drawing upon receipt of a Certificate of Completion (COC) confirming that the job is complete (Section 8.3.8).

e. The other drawings required to depict fabrication details shall be the appropriate size and shall have an EMI document number.

7.5 MAKE-FROM DRAWINGS

a. This baseline drawing is generated to document a change to a component or piece of equipment purchased from a vendor as a complete unit and not shown in detail on any SORD drawings. These units are identified by a vendor drawing or identified in O&M manual by procurement specification number.

b. This vendor data shall be retained in CEF.

8.0 CONFIGURATION CONTROL OF SORD BASELINE

8.1 CONFIGURATION BASELINE

a. The configuration baseline is identified by SORD documentation and systems requiring configuration control as identified by the CCB responsible for the respective system (hereafter referred to as baseline).

b. Changes to baseline shall be documented as specified in Section 8.3.3.

c. All changes to baseline shall be monitored by a CCB. Refer to SOI-8040-0001-FACENG and SPR 1150.1.

8.2 ADMINISTRATIVE CHANGES

a. Administrative changes are permitted on all drawings for correcting typographical and grammatical errors.

b. Administrative changes shall be treated like any other change or drawing revision, and filed in CEF.

c. An administrative change shall be indicated by adding a letter "A" immediately following the revision number. All subsequent administrative changes should be made in like manner (i.e., a drawing may have more than one "A" following the revision number).

d. When the drawing is revised, the revision number shall be changed and the "A" designation(s) shall be deleted.

e. Administrative changes may be approved only by signature of the Drafting/Standards Manager or designee.

8.3 DRAWING REVISIONS/CANCELLATION

The following requirements provide for configuration accountability through the design, implementation, and documentation phases of configuration changes.

8.3.1 Drawing Cancellations

a. To cancel a drawing that is being replaced:

1. Write in the title block revision space that the drawing is canceled, per what authority has it been canceled, and refer to the new SORD drawing number.

2. Above the description, write the word "Canceled".
3. Crosshatch the drawing.

b. To cancel a drawing that will not be replaced:

1. Write in the title block revision space that the drawing is canceled and per what authority it has been canceled.
2. Above the title block description, write the word "Canceled".
3. Crosshatch the drawing.

8.3.2 Drawing Revisions

a. Revision to any SORD baseline drawing shall be made only when authorized.

b. Each revision to a SORD baseline drawing shall be reviewed and electronically signed by an authorized NASA Engineer before issuance by CEF.

c. SORD drawing revisions require that an EMI package, or approved EO/ECR from Engineering and Test Directorate (E&TD), be generated to ensure proper review and to document the change. (Refer to Sections 8.3.4, EMI and 8.3.5, EO.)

d. Request For Information (RFIs, Form SSC-781 per SOI-8040-0001-FACENG), FCRs (Section 8.3.6) and change requests (Section 8.3.7) shall be used for revisions made during construction.

8.3.2.1 EO Incorporation

Refer to Sections 8.3.5.1 and 8.3.5.2.

8.3.2.2 As Designed

When an uncompleted project is in construction, the Drafting/Standards Manager is authorized to incorporate the project as designed to allow documentation to be updated. When the project is complete and redline changes are provided with the COC, the redlines will be incorporated into the SORD drawings.

8.3.2.3 SORD Review and Acceptance

a. All "approved SORD" baseline drawing revisions must be reviewed and accepted by the NASA SSC Center Operations assigned Project Manager. E&TD may use electronic signature for Test Complex (TC) 11 P Series SORD drawings.

8.3.2.4 Main Plan Views and Sections

a. The main plan views, elevations, sections, and views shall be reviewed and revised as required.

b. The detailed sections and views shall be modified to reflect design changes that affect the overall dimension of the building.

8.3.2.5 Utility Drawings

a. Utility drawings will be updated using information gained from digging permits to find if a change has been made by authority and no COC was prepared. The information will be consolidated and assigned an EO number against baseline documentation.

b. When utilities are being cut off, re-routed and/or abandoned in place due to a demolition project, a COC must be prepared and submitted to CEF to be incorporated into the baseline documentation.

8.3.3 Engineering Modification Instruction (EMI)

a. The EMI (form SSC-151) is a multiform change control document that provides control of changes to the SORD baseline drawings.

b. EMIs are generated when the request is made to change the baseline configuration with proper documentation.

c. Changes can be requested by Facility Change Request (FCR) form SSC-61, Engineering Change Request (ECR) form SSC-650, Task Order, Project Data Sheet (PDS) form SSC-702, or by letter to the Facilities Review Board (FRB). EMIs are prepared as specified in SSTD-8070-0002-CONFIG, *Facilities Drafting Manual*.

8.3.3.1 Review and Approval of EMI

a. The appropriate NASA divisions shall receive copies of EMI packages, which must be approved by NASA SSC Project Management and NASA Safety before any construction may be implemented.

b. Configuration change and EMI approval process flow are illustrated in Figures 2 and 3.

Figure 2. Process Flow Chart for Configuration Changes

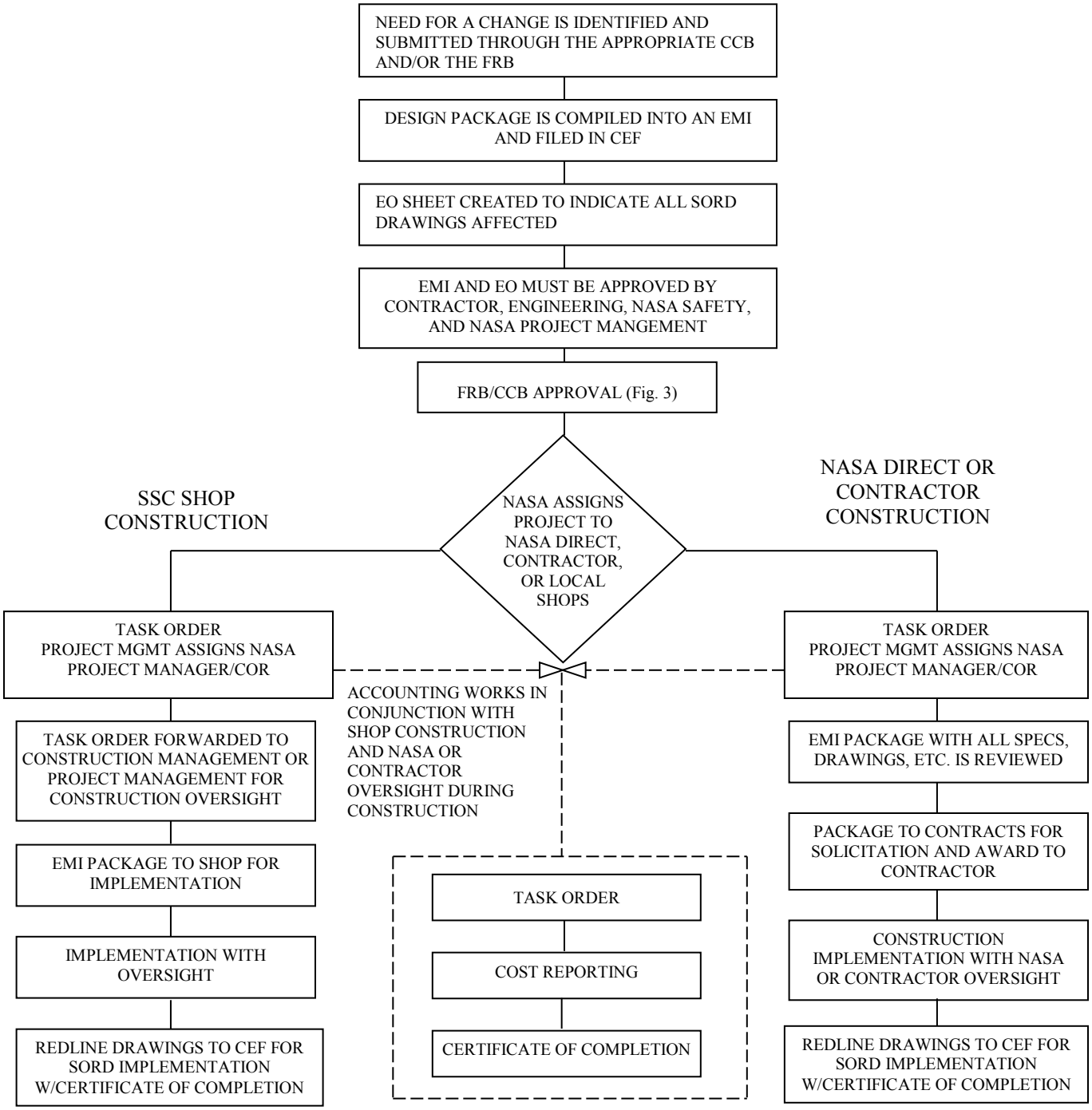
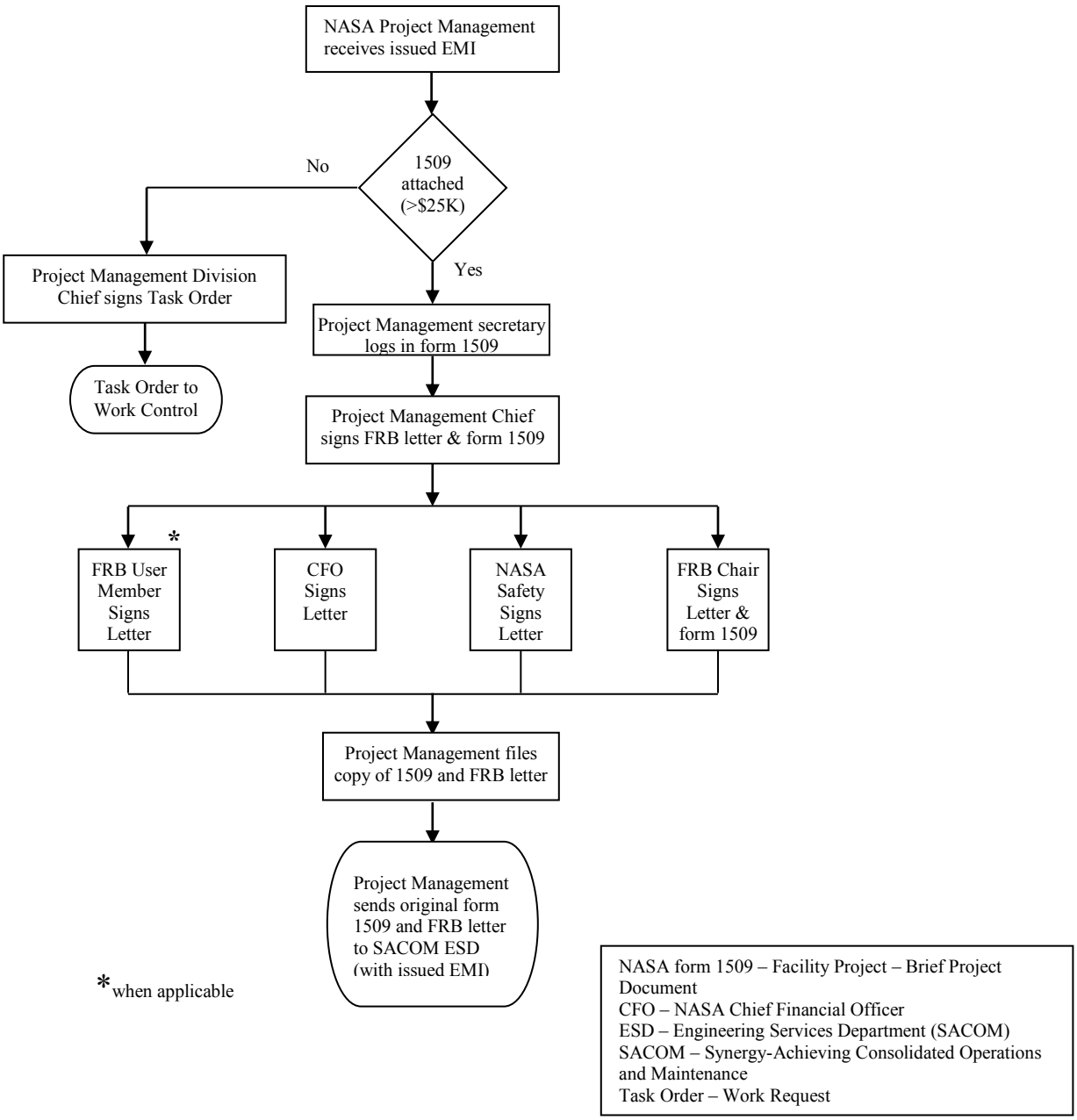


Figure 3. Process Flow Chart for Facility Review Board (FRB) Approval of Engineering Modification Instruction (EMI)



8.3.3.2 Implementing EMI Changes

a. To implement an approved change, an EMI, sketch package, Statement Of Work (SOW), Task Order with a COC, or a redline with COC shall be used by engineering for all changes to facility baseline.

b. Implementation documents shall include sufficient delineation notes to provide only one interpretation of the desired end product.

c. The documents shall include EMI index; EOs, installation, assembly, detail assembly, or detail design, and parts list, as required. Items having multiple use such as special supports, clamps, brackets, tools, or electrical splice build-ups may be prepared on separate assembly or detail drawings.

d. Multiple-use drawings shall be permanent baseline standard drawings. Sketches may be utilized as required, depending on the degree of construction clarification needed. The specification portion of the implementation documents should complement the drawings and be sufficient yet brief enough to convey the engineer's intent to the builder.

e. Implementation of construction projects in excess of $25,000 shall be approved by the FRB via NASA form 1509, Facility Project Document.

f. Implementation of construction projects less than $25,000 shall be approved by FRB approval letter or Task Order signed by FRB representative. Refer to Figure 3.

8.3.3.3 Revisions to EMIs

a. The EMI documents or Parts List may be revised upon obtaining the originals from CEF.

b. The revised document shall be approved per Section 8.3.4.1 and subsequently distributed by CEF.

c. The original package index and EO (reference Section 8.3.5) shall be revised if any subsequent sheet in the package is revised. A brief description of the revision should be entered in the revision column.

d. The revision designation shall be entered adjacent to the changed data, new data shall be entered and the area/zone of the affected drawing shall be noted in the revision column.

e. General provisions for EMI revisions are as follows. For details, refer to SSTD-8070-0002-CONFIG.

1. Other than standard-size drawing sheets may be used, such as brief sketches. Use of an EMI Index Sheet is required.
2. If other than standard formats are used, they shall be identified and approved in the same manner as the EMI document (reference Section 8.3.4.1).
3. When the EMI requires specifications, the specifications shall conform to the maximum extent possible with SpecsIntact format (reference SSTD-8070-0004-CONFIG).
4. When the EMI requires a parts list, include reference information on the package index under interim documentation.
5. When the EMI requires addition of new equipment or a new facility for which there is no existing baseline drawing, new drawings shall be generated.
6. EOs (reference Section 8.3.5) shall be generated as required to document the interfaces.
7. EOs shall reference the new drawings.
8. The "Comments" block of the EMI cover sheet shall include a note that documents are to be changed to SORD upon receipt of the COC (reference Section 8.3.8).
9. The original EMI package index shall always be revised for subsequent releases.

8.3.4 Engineering Order (EO)

a. An EO is a written document (form SSC-151D) that denotes SORD drawing changes made by SACOM. It calls out the drawing number and the EMI that documents the change.

b. EOs provide a method to document approved drawing changes prior to receipt of baseline original drawings or prior to actually making changes on the drawing.

c. EOs are used to change SORD drawings only and shall not be used to change EMIs (reference Section 8.3.3).

8.3.4.1 EO Procedures.

The following rules shall be adhered to without deviation when preparing, issuing, incorporating, or canceling EOs.

a. EOs will be assigned when the EMI is issued for construction.

b. EO numbers are assigned by CEF only against current, baseline drawings, and only when authorized by an approved EMI (reference Section 8.3.3). **Note:** CEF shall not be contacted for EO assignments until just prior to the EMI package going to construction.

c. EO numbers shall be assigned and released only once. Further revision or correction requires that a subsequent EO be issued which cancels and supersedes the issued EO. (The cancelled EO and the new EO shall be marked as specified in Section 8.3.5.1.)

d. The EO number shall consist of the root number of the baseline drawing followed by the letters "EO" followed by the EO sequence number.

e. EOs must be released in numerical sequence.

f. The EO title shall be identical with the title of the EMI.

g. EOs may have multiple sheets appropriately numbered.

h. For EOs which document a change already accomplished or which does not affect existing hardware, the words "Documentary Release" shall appear across the top of the EO.

i. EO “Documentary Release” distribution shall be limited to information only.

j. When generating an EO against a Tech System Wiring Tab List, the pre-printed tab list EO form shall be used in lieu of EO form SSC-151D.

k. An EO that is inadvertently written may be referenced on the EMI Index Sheet without revising the drawing.

l. An EO may be canceled in either of the following ways:

1. Generate a new EO on a new form. Across the top of the form, add the note "EO __ CANCELS AND SUPERSEDES EO __."

2. Check the original EO out of CEF, run a copy and enter "EO __ CANCELED, SUPERSEDED BY EO __" across the top of the copy; return copy to CEF. Make any changes necessary on the original. Place the new EO number in the title block; add the note "EO __ CANCELS AND SUPERSEDES EO __."

   Note: Remove all signature and CEF issue dates. The new EO must be reviewed and approved by NASA Engineering and NASA Safety then issued through the CEF release system.

8.3.4.2 EO Incorporation

a. When a project is completed, all outstanding EOs against a SORD baseline drawing shall be incorporated in chronological order into the drawing.

b. All existing EOs must be reviewed for their technical content so that all affected drawings are revised.

c. If an EO inadvertently omits one or more SORD drawings that are affected by the change that generated the EO, then the EMI shall be revised to include the omitted drawings during documentation update.

d. All revision numbers shall be entered in the symbol column of the revision block.

e. The main plan views, elevations, sections and views shall be reviewed and revised as required.

f. When an EO carries so much delineation that it cannot be incorporated into the drawing against which it was written, a new drawing shall be created.

   1. A new baseline drawing number shall be assigned under authority of the EMI which authorized the original EO.
   2. Cross-reference both the new drawing and the original baseline drawing. Example: "WORK THIS DRAWING WITH XXXXX-XXXX."

g. When adding views, sections, or details to the baseline drawing, use the next unused letter or number available.

h. When deleting notes, leave the number of the deleted note in place with the correct revision symbol. Do not renumber the remaining notes to maintain the numerical sequence.

8.3.5 Field Change Request (FCR)

8.3.5.1 General

a. The FCR (form SSC-61) is a subsidiary change document authorizing deviation from a released design package/EMI (reference Section 8.3.3). It is used to obtain official approval to change the design package/EMI before the EMI is completed and accepted by NASA.

b. Once the approved changes are incorporated and the EMI is closed, a new EMI is required to further change the baseline drawings.

c. Reasons for issuing an FCR include the following:

1. changes in the scope of requestor's requirement,
2. incorporation of construction improvements,
3. deletion of unnecessary features,
4. equipment changes to meet safety requirements or SSC Standards,
5. unavailability or slow delivery of materials,
6. resolution of coordination problems,
7. changes in technological improvements that may reduce the cost of the project.

8.3.5.2 Disposition

a. In accordance with SPR 1150.1, all FCRs shall be reviewed and dispositioned (i.e., approved or disapproved) by the appropriate CCB (and/or FRB) responsible for the area and the EMI that is used to create or change SSC facilities configuration baseline (reference SOI-8040-0001-FACENG).

b. Upon submittal of the COC (reference Section 8.3.8), the Construction Monitor or Project Engineer shall provide CEF with a copy of each FCR that has been approved for implementation. (**Note:** The signature block for the Construction Monitor may be signed by the Project Engineer in cases where the Project Engineer is implementing the changes.)

8.3.5.3 Processing

a. When incorporating FCRs into the released engineering, sufficient explanation shall be included in the Revision Column on the EMI Document or Parts List.

b. The Revision Column on those documents shall read "Inc. FCR _____."

c. The EMI Package Index Revision Column shall carry the notation "Inc. FCR _____" in addition to indicating those individual documents that have been revised. These FCRs may be incorporated during construction at the discretion of the NASA Construction Management Division Chief following CCB approval, or held until project completion and incorporated per Section 8.3.8.

d. A group of FCRs may be incorporated as a single revision. If FCRs are incorporated into a document during construction, the drawing shall be revised.

e. Upon receipt of the revised engineering documentation that verifies incorporation of the FCRs, CEF shall archive the FCRs.

8.3.6 Change Request/Board Disposition

8.3.6.1 Change Request

a. A request for change to SSC facilities configuration baseline, including system components as identified in the Technical Components Configuration database maintained by CEF, is initiated before the change is made.

b. The request shall be submitted to the appropriate board (CCB and/or FRB) in accordance with the board's process and documentation requirements. (Refer to SPR 1150.1 and SOI-8040-0001-FACENG.)

c. For changes affecting critical systems under control of the NASA SSC Engineering & Test Directorate (E&TD), change requests shall be made with an Engineering Change Request (ECR, form SSC-650), in accordance with SOI-8080-0015.

8.3.6.2 Board Disposition

The responsible CCB and/or FRB review the request for change and approve or disapprove the request.

8.3.7 Certification/Configuration Control Card (CCC)

8.3.7.1 General

The 4-part Certification/Configuration Control Card (CCC) (form SSC-633) documents the configuration and certification of components that are processed through the Fluid Component Processing Facility and are then stored in the warehouse or installed in the field. It also documents the location and date of installation of the component in the field. All SSC agencies are required to use the CCC.

8.3.7.2 CCC Procedures

a. CEF shall use the CCC to update the Technical Components Configuration database when components are installed in the field, and the authorizing Task Order number is provided in the appropriate place on the CCC.

b. Instructions for CCC processing are provided in SSTD-8070-0006-CONFIG.

8.3.8 Certificate of Completion (COC)

8.3.8.1 General

a. The COC (form SSC-625) verifies completion of both subcontractor and in-house construction projects. All Engineering Modification Instructions (EMIs) require a COC, even if the EMI is for procurement only.

b. The COC initiates the updating of SORD drawings and provides for the collection of other documentation applicable to a project. The COC is prepared and completed as specified in SSTD-8070-0009-CONFIG; and CEF distributes the COC and related documentation in accordance with SSTD-8070-0009-CONFIG and EF-P-03.

8.3.8.2 COC Documentation

a. For a COC to be finalized, it must be submitted to CEF with applicable documents from the following list: FCRs; ECRs; redlined construction drawings; SSC facilities equipment list (SSTD-8070-0010-CONFIG); warranty information, operation and maintenance manuals (O&M); manufacturer's spare parts lists; punch lists; revised panel schedules; Dig Permit (Form SSC-618); abatement plan; CCC 4-part card, and NASA form 1046.

b. CEF shall forward the original NASA form 1046 to Real Property and copies of all COCs and any applicable associated documents to the appropriate function areas, in accordance with procedures in EF-P-03.

9.0 REPORTS AND STUDIES

9.1 GENERAL

Reports and studies often contain significant amounts of useful data and background information which should be archived for future use, even if the report or study contains recommendations or conclusions which may or may not have been accepted. (The conclusions and recommendations contained in a report or study do not necessarily require follow-up action. They are simply the opinions of the person completing the study.)

The requestor of a report or study receives a draft of the document, accepts it if it meets the initial requirements, prepares written comments, and forwards the document and all comments to NASA Engineering, which adds additional comments and forwards the document and all comments to the contractor. When the review of the document is complete and when all comments have been incorporated or addressed to the satisfaction of NASA Engineering, the contractor forwards the completed report with all comments to CEF for archiving and issuance. Reports and studies are numbered by crew, fiscal year and sequence number.

The report or study is complete when the requestor accepts the document as meeting the requirements. The basic document will not be changed after acceptance, and all funding will cease. Additional work scope or follow-up effort will require separate funding in accordance with normal procedures.

9.2 REQUIREMENTS

9.2.1 Requestor

Requestors are responsible for the following.

a. Insure that adequate funding is available for the report or study.

b. Provide clear definition of requirements.

c. Review the completed document and ensure that all requirements have been met.

d. Comment on the document's conclusions and recommendations, attach the comments to the document, and forward the document to NASA Engineering for review.

e. Initiate follow-up actions if appropriate after issuance from CEF.

9.2.2 NASA Project Manager

The NASA assigned Project Manager will be responsible for the following.

a. Review the report or study and comment if appropriate.

b. Attach comments to the document and forward to performing contractor (if an offsite contractor performs study then NASA may issue the report to CEF).

9.2.3 CEF

CEF will be responsible for the following.

a. Issue document and all comments with copies to the requestor, to the contractor who wrote the document, and to the NASA assigned Project Manager.

b. Archive the document with comments attached.

10.0 CADD APPLICATION

10.1 GENERAL

10.1.1 Format

a. All design drawings, except for engineering sketches, shall be created and/or revised in CADD format and conform to SSTD-8070-0002-CONFIG.

b. Hard copies with 100% replication of the CADD databases shall be provided by CEF for NASA signature.

c. These original hard copies shall be marked for release by CEF prior to archiving.

10.1.2 Backups and Archiving

a. Retention of backups and archives on electronic media shall be the responsibility of SACOM Drafting.

b. In addition, CEF shall also be responsible for the issuance and distribution of CADD drawing files or hard copies.

10.1.3 Directories Hierarchy

a. The Drafting/Standards Manager or designee shall establish and maintain a hierarchy of protected directories and files in the CADD database.

b. Files shall be segregated by type: EMI, SCD, SORD, etc. User access to the database shall be established by the ESD Chief.

10.1.4 Record.

Basic records retention policy of 100% redundancy shall be used as a guideline for backup procedures. Outside-contracted Architect & Engineering (A&E) firms shall supply CEF with Auto CADD electronic and hard copies of all drawings.

10.2 DRAWING PRACTICES AND STANDARDS

Drawing practices and standards for the preparation of CADD drawings are defined in SSTD-8070-0002-CONFIG, *SSC Facilities Drafting Manual*.

11.0 RECORDS AND FORMS

a. Records and forms identified in this SSTD shall be maintained in accordance with applicable requirements of SPR 1440.1.

b. Forms necessary for this standard are as follows:

1. NASA form 1046*, Transfer and/or Notification of Acceptance of Accountability of Real Property*
2. NASA form 1509, *Facility Project Document (FPD)*
3. SSC-61, *Facility Change Request (FCR)*
4. SSC-151, *Engineering Modification Instruction (EMI)*
5. SSC-151D, *Engineering Order (EO)*
6. SSC-618, *Dig Permit*
7. SSC-625, *Certificate Of Completion*
8. SSC-633, *Certification/Configuration Control Card*
9. SSC-650, *Engineering Change Request (ECR)*
10. SSC-702, *Project Data Sheet (PDS)*
11. SSC-781, *Request For Information*

c. For quality records, refer to the SSC Master Records Index. Forms are assumed to be the latest edition unless otherwise specified and may be obtained from the SSC Electronic Forms repository or from the NASA SSC Forms Management Officer.

12.0 ACRONYMS AND ABBREVIATIONS

A&E	Architect and Engineering
CADD	Computer Aided Design and Drafting
CCB	Configuration Control Board
CCC	Certification/Configuration Control Card (form SSC-633)
CEF	Central Engineering Files
CFO	NASA Chief Financial Officer
COC	Certificate of Completion (form SSC-625)
COR	Contracting Officer's Technical Representative
DWG	Drawing
E&TD	Engineering & Test Directorate
ECR	Engineering Change Request (form SSC-650)
EMI	Engineering Modification Instruction (form SSC-151)
EO	Engineering Order (form SSC-151D)
ESD	Engineering Services Department
FCR	Field Change Request (form SSC-61)
FM&O	Facilities Maintenance & Operations

FRB	Facilities Review Board
MMO	Minor Maintenance Order
MSO	Minor Service Order
NASA	National Aeronautics and Space Administration
NPR	NASA Procedural Requirements
O&M	Operations and Maintenance
PDS	Project Data Sheet (form SSC-702)
RFI	Request For Information (form SSC-781)
SACOM	Synergy-Achieving Consolidated Operations and Maintenance
SCD	Specification Control Drawing
SI	International System of Measurements (metric)
SOI	Stennis Organizational Instruction
SOMRD	System Operation and Maintenance Responsibility Database
SOP	Standard Operating Procedure
SORD	Site-wide Operation Repair Document
SOW	State Of Work
SpecsIntact	Specifications kept Intact, software at all NASA centers
SPR	SSC Procedural Requirements
SSC	Stennis Space Center
SSTD	SSC Standard
STD	Standard
STE	Special Test Equipment
SWI	SSC Work Instruction
TC	Test Complex